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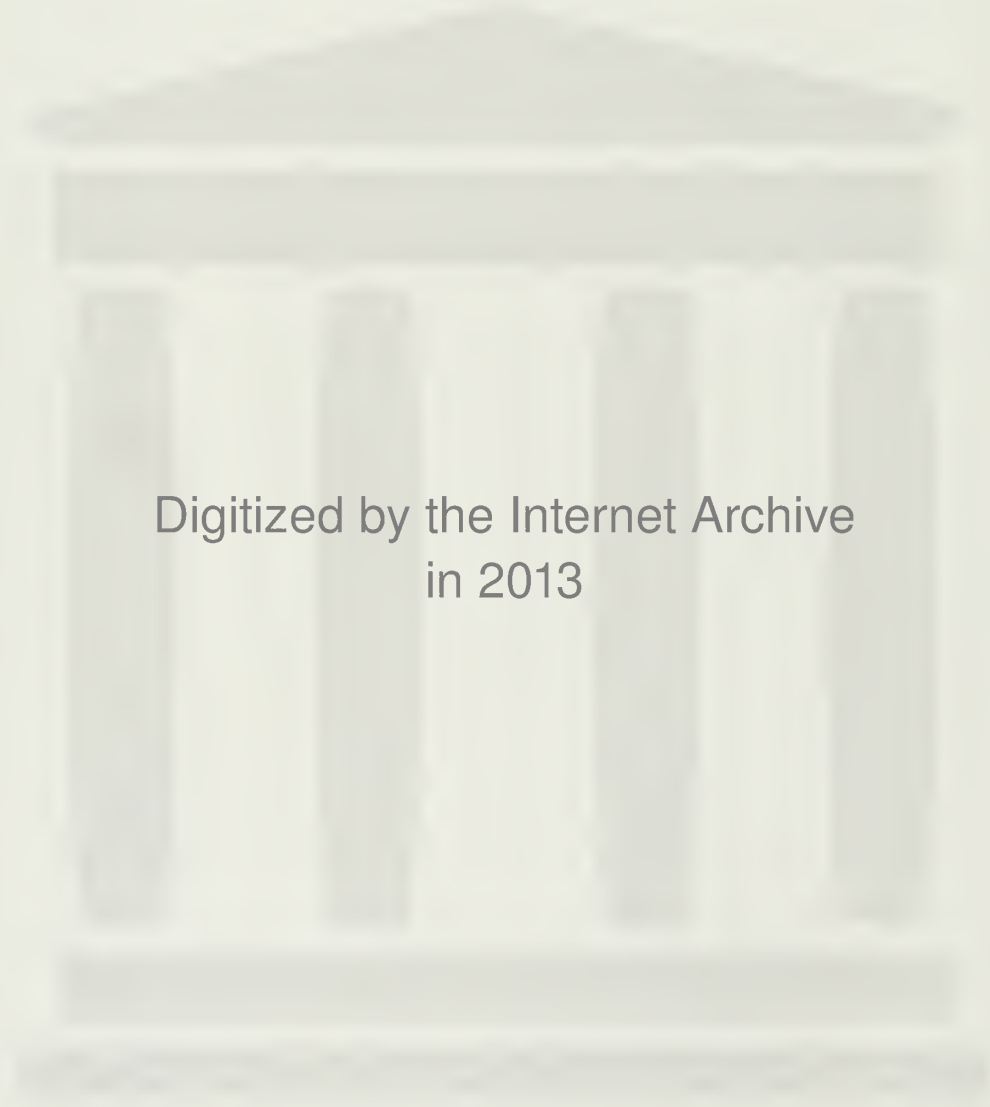
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When Classroom Teachers Learn to Fly

AERONAUTICS BULLETIN NUMBER 20

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Leslie A. Bryan, Ph.D., LL.B., Director *Helen S. Hughes, Editor*

UNIVERSITY OF ILLINOIS BULLETIN

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When Classroom Teachers Learn to Fly

By

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Professor of Education
University of Illinois

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Foreword

This bulletin reports the results of an experiment conducted to determine what, if any, changes take place in the attitudes of teachers when they learn to fly. As far as is known, the experiment represents the first attempt to study what happens to the behavior of secondary-school teachers after they learn to pilot an aircraft.

Dr. Harold C. Hand, Professor of Education in the College of Education of the University of Illinois, conducted the experiment. The results are reported herein. Professor Hand is a thoroughly competent observer and researcher of educational matters. He has long been a teacher of teachers. For many years he has flown his own airplane in carrying on his extensive lecture appearances in all parts of the United States. Dr. Hand's experience and interest, therefore, uniquely qualify him for the type of experiment he reports in the monograph.

The funds for carrying out the research were provided by the Link Foundation, Inc., a non-profit foundation having a special interest in aviation education and training matters. Likewise, the funds for the publication of the results of the experiment were provided by the Link Foundation.

In this monograph, as in all similar publications of the Institute, the author has complete freedom to express his opinions, with the understanding that he has assumed full responsibility therefor.

January 1958 LESLIE A. BRYAN, *Director*

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WHEN CLASSROOM TEACHERS LEARN TO FLY

I

What, if any, differences in their points of view regarding aviation education, and what, if any, differences in what they later do in their classrooms, do high school teachers say are associated with their having taken the Teachers' Flight Experience Course at the University of Illinois? These are the questions which were put to the test in the exploratory study whose findings are reported in these pages.

The Teachers' Flight Experience Course is described in detail in another Institute of Aviation publication,[1] so only its chief features will be noted here. The central purpose of this course is to provide the minimum in the way of flight training and related experiences which it is believed that many, if not most, classroom teachers need in order to feel comfortably self-confident in giving attention to aviation education in their classrooms. In this course, the classroom teacher receives sufficient flight instruction to be able to fly solo; he is at the controls in a dual cross-country flight which takes him into a small-city airport; and he is flown with two of his fellows into Midway Airport in Chicago where a half-day or more is spent in visiting CAA traffic control and weather operations and in seeing what goes on behind-the-scenes in the operation of a major air line. The return flight from Chicago is made at night, usually by flying the beam to Lafayette, Indiana, and proceeding from there to Urbana-Champaign by flying the compass. The trip to Chicago is made in a Beechcraft Bonanza, the airplane employed by the Institute of Aviation in conducting its extensive ferry service for University of Illinois personnel, so this experience also serves to familiarize the teachers with this aspect of aviation. During their flight training, the teachers receive instruction in the School Link Trainer and are briefed on its principal uses. They are also, of course, made familiar with the regular flight training program and with the aircraft maintenance and repair instruction given by the Institute of Aviation.

II

The subjects in the exploratory study here reported were 29 classroom teachers and three guidance counselors. All except one were located in various widely-scattered secondary schools in Illinois; the other was a core course teacher in a well-known Indiana secondary school. The 28 Illinois teachers were distributed as follows, in respect to their major

[1] Leslie A. Bryan, *Flight Experience Course for Teachers and Business Men,* Aeronautics Bulletin No. 19, University of Illinois, June, 1956.

teaching fields: art, one; English, three; industrial arts, two; mathematics, three; science, eleven; social studies, eight.

Each teacher in the study agreed to do the following four things:

1. To take the Teachers' Flight Experience Course at the University of Illinois. None of the 32 subjects had had any prior flight training.

2. Immediately prior to taking this course, to complete a somewhat lengthy inventory (see Appendix A). This inventory is structured around the 71 objectives of aviation education which were developed in the National Security Study earlier conducted under the auspices of the Illinois Curriculum Program.[2] The nature and scope of these objectives presuppose that aviation education should be a component of the general education of all students, and that it should be achieved through the enrichment of existing courses in the school curriculum.

3. Immediately after completing the Teachers' Flight Experience Course, to repeat the same inventory for purposes of revealing what, if any, changes in attitude toward the objectives of aviation education had taken place. In respect to each of these 71 objectives, the inventory asks the respondent to tell (a) whether or not he sees it as being sensibly related to his teaching field, (b) if seen as being so related, how important he believes it to be for him to help his pupils achieve it, and (c) how confident he is of his ability to do so.

4. At the end of the ensuing school year, to respond to a letter asking him to tell what, if anything, he had done differently in his capacity as a teacher which seemed to him attributable to the aviation-related experiences provided under the auspices of this study. These experiences differed for each of the three groups into which the 32 subjects in this study were divided. As implied above, the teachers in all three groups took the Teachers' Flight Experience Course, completed the pre-flight- and post-flight-experience inventory, and were asked to respond to the letter just noted. This was all that the first group, made up of ten classroom teachers, was asked to do. Each of the nine classroom teachers in the second group agreed, in addition, to read a resource unit in aviation education beamed directly at his teaching field.[3] These resource units were not supplied to the teachers in Group II until after steps 1, 2, and 3 above

[2] Charles W. Sanford, Harold C. Hand, and Willard B. Spalding (editors), *The Schools and National Security,* McGraw-Hill, New York, 1951, pp. 238-46.

[3] Virginia Casey, *English Teaching Aids for a Stronger America,* Our World of Flight Series, Bulletin 22, Part E, Illinois Curriculum Program — Aviation Education Project, Office of Superintendent of Public Instruction, Springfield, Illinois, 105 pp., 1955.

Emery G. Fritsch, *Science Teaching Aids for a Stronger America,* Our World of Flight Series, Bulletin 22, Part A, Illinois Curriculum Program — Aviation Education Project, Office of Superintendent of Public Instruction, Springfield, Illinois, 148 pp., 1955.

Harry D. Lovelass, *Guidance Aids for a Stronger America,* Our World of

had been completed by them. No two of the teachers in either the first or the second groups were from the same school or school system. The members of the third group, made up of ten classroom teachers and three guidance counselors, were from one or the other of three secondary schools, with no fewer than two persons and no more than five being on the staff of any one institution. In addition to doing all that the second group did, the members of the third group had the experience of knowing from the outset that their superintendents and/or principals either already had taken or had declared their intentions of taking the Teachers' Flight Experience Course. None of the administrative heads of any of the schools or school systems represented by the teachers in the other two groups had had or was taking flight training. One additional difference remains to be noted: the teachers in Group III were supplied with their resource units at the very outset of the study.

III

We shall first take note of the changes in attitude which took place contemporaneously with their flight experience on the part of all 32 subjects included in the study. As the data of Table 1 indicate, the median (midpoint) number of objectives of aviation education that the teachers saw as being sensibly related to their respective teaching fields was 40 (out of a possible 71) prior to taking the Teachers' Flight Experience Course, and that this measure of central tendency was 57 at the conclusion of the course. This is slightly more than 42 percent increase. Both before and after taking the course, it was a teacher of industrial arts who saw the smallest number of the stated objectives as being sensibly related to his teaching field. Prior to flight experience, there was but one teacher — a teacher of English — who said that all 71 of the objectives were so related to her specialty. She was of the same opinion at the conclusion of the course. Three others, all teachers of the social studies, were of a similar mind by the time they had completed their flight experience.

Flight Series, Bulletin 22, Part C, Illinois Curriculum Program — Aviation Education Project, Office of Superintendent of Public Instruction, Springfield, Illinois, 124 pp., 1955.

Jack C. Merwin, *Mathematics Teaching Aids for a Stronger America,* Our World of Flight Series, Bulletin 22, Part B, Illinois Curriculum Program — Aviation Education Project, Office of Superintendent of Public Instruction, Springfield, Illinois, 82 pp., 1955.

M. Annette Sheel, *Social Studies Teaching Aids for a Stronger America,* Our World of Flight Series, Bulletin 22, Part D, Illinois Curriculum Program — Aviation Education Project, Office of Superintendent of Public Instruction, Springfield, Illinois, 171 pp., 1955.

(NOTE: These five publications are available to the general public through the National Aviation Education Council, 1025 Connecticut Avenue, N.W., Washington 6, D.C.)

TABLE 1 Number of Objectives of Aviation Education Seen by Teachers as Being Sensibly Related to Their Teaching Fields (Total Number of Objectives — 71)

	MEASURE				
	Highest Number	Q3	Median Number	Q1	Lowest Number
Before Taking Teachers' Flight Experience Course	71	55	40	29	16
After Taking Teachers' Flight Experience Course	71	67	57	36	21

Of the other 28 teachers, only three indicated in their second opinionaire that fewer of the 71 objectives were seen as being sensibly related to their teaching fields. One, a teacher of the social studies, initially said that he so viewed 33 of these objectives. At the conclusion of his flight experience, he placed but 23 objectives in this category. Both of the other two subjects who "regressed" in this manner (31, 27; 65, 62) were teachers of science. A fourth person, also a science teacher, underwent no change of viewpoint in this respect (46, 46). Of the remaining 24 teachers, all reported an increase in the respect here noted. As the data of Table 1 make clear, the interquartile range moved sharply upward from 29–55 to 36–67 during the period when the teachers were undergoing flight experience.

Even more noteworthy, however, was the growth in self-confidence which the teachers said was developed during the time they were enrolled in the Teachers' Flight Experience Course (see Table 2). It will be observed that the upper limit of the pre-flight-experience is identical with the lower limit of the post-flight-experience interquartile range (14–28; 28–59). The post-flight median was 43, an increase of 115 percent over the median of 20 yielded by the pre-flight inventory. These

TABLE 2 Number of Objectives of Aviation Education Which the Teachers Said They Were Confident of Their Ability to Handle

	MEASURE				
	Highest Number	Q3	Median Number	Q1	Lowest Number
Before Taking Teachers' Flight Experience Course	69	28	20	14	0
After Taking Teachers' Flight Experience Course	70	59	43	28	2

TABLE 3 Changes in Attitude During the Period of Flight Experience: Number of Objectives of Aviation Education Which the Teachers Said It Was of (a) Greater, (b) the Same, or (c) Less Importance for Them to Help Their Pupils to Achieve

	MEASURE				
	Highest Number of Objectives So Viewed	Q3	Median Number of Objectives So Viewed	Q1	Lowest Number of Objectives So Viewed
Seen as Being of Greater Importance than Formerly Believed to Be	58	30	17	10	1
Seen as Being of the Same Degree of Importance	70	57	50	39	13
Seen as Being of Less Importance than Formerly Believed to Be	16	6	1	0	0

gains seem to border on the spectacular. No teacher reported any loss of self-confidence in respect to his ability to handle any objective that he saw as being sensibly related to his teaching field.

Contemporaneously with their flight experience, all of the teachers said they had come to believe that it was more important than they had formerly thought it to be for them to help their pupils to achieve the objectives of aviation education, varying from one objective (a teacher of mathematics) to as many as 58 (a teacher of English) of the 71. One-fourth of the teachers were of this mind in regard to 30 or more, and half said this was true of their thinking in respect to 17 or more of these objectives (see Table 3). Conversely, only one person (a teacher of science) revised his opinion negatively in respect to as many as 16 of the 71 objectives; three-fourths of the teachers did so in connection with no more than five, and for half this was true in respect to but one or none of these objectives.

To summarize up to this point, we have seen that, contemporaneously with their flight experience, the 32 teachers as a whole strongly tended to regard more of the objectives of aviation education as being sensibly related to their teaching fields, to gain very markedly in self-confidence respecting their ability to help their pupils achieve these objectives, and to feel that it was more important for them to help their pupils pursue many of these objectives than they had formerly thought to be the case.

It will be remembered that the teachers were divided into three groups on the basis of the differing natures of their aviation-related experiences. To recapitulate, Group I was made up of ten persons who

TABLE 4 Mean Number of Objectives of Aviation Education Seen by the Teachers as Being Sensibly Related to Their Teaching Fields

Group	Before Taking TFEC*	After Taking TFEC	Difference
Groups I and II	45	55	10
Group III	37	47	10

* Teachers' Flight Experience Course

had only the Teachers' Flight Experience Course. The nine persons in Group II were in addition given copies of resource units beamed specifically at their respective teaching fields, but these were not supplied until after these teachers had completed their post-flight-experience inventories. Two additional factors were operative in the case of the 13 teachers in Group III: they were in possession of their resource units prior to flight-experience, and they knew from the moment they were invited to take part in the study that either their principals or their superintendents, or both, had either just completed or agreed to take the Teachers' Flight Experience Course — hence, presumably, that the administrative heads of their schools were in sympathy with the idea of more fully involving their faculty members in the business of aviation education. Obviously, these observations afford no reason for believing that, during the period of their flight experience, the teachers in Groups I and II had been differently influenced in respect to their viewpoints respecting aviation education. No less obviously, those in Group III might well have been influenced by the additional factors which they experienced but which the teachers in Groups I and II did not undergo.

These considerations made it desirable to compare the changes in teacher attitude which took place contemporaneously with flight experience in Groups I and II combined with those that occurred in Group III. Table 4 reports the data which bear on the first of the three comparisons which were thus made. It can be seen that the means of the increases in the number of objectives of aviation education seen as being sensibly related to their teaching fields were identical. Prior to taking the Teachers' Flight Experience Course, the persons in Group III typically saw but 37 instead of 45 of these 71 objectives as being so related, but by the time they had completed their flight experience they too had typically come to believe that some ten more of these purposes were relevant to their teaching specialties.

We can only conjecture as to why the teachers in Group III both initially and at the conclusion of the Teachers' Flight Experience Course saw fewer of the objectives of aviation education as being sensibly related to their teaching fields than did the teachers in Groups I and II. It

TABLE 5 Mean Number of Objectives of Aviation Education Which the Teachers Said They Were Confident of Their Ability to Handle

Group	Before Taking TFEC	After Taking TFEC	Difference
Groups I and II	25	47	22
Group III	20	38	18

cannot be explained in terms of the sex of the teachers involved for, percentagewise, Group III was almost exactly constituted the same as Groups I and II combined in this respect — 70 percent, men; 30 percent, women. Nor, does it seem, can it be attributed to overtones emanating from the relationships of the teachers in Group III with the administrative heads of their schools. These relationships were known to be good, so we reject the hypothesis that these teachers either consciously or subconsciously "drew back" in order to placate some ruffled feeling respecting their superintendents or principals. Age may have been a factor, for the average age in Group III was estimated by the writer to be about 45 and that in Groups I and II combined about 35 years. More plausible, in the writer's opinion, is that the teachers in Group III may have at least scanned their resource units as soon as or very shortly after these were placed in their hands, which was prior to the administration of the pre-flight-experience inventory. If they did indeed do so, the likelihood is very great that they were influenced to some degree by noting the restricted number of objectives with which the resource units in their respective fields attempt to deal. As said, however, this is but conjecture. All that is known for certain is that these teachers typically reported an increase of some 25 percent in the number of objectives of aviation education which they saw as being sensibly related to their teaching fields. Percentagewise, incidentally, the increase for Groups I and II combined was slightly less: it figures out at 22 percent.

Our second comparison relates to the matter of self-confidence. As the data of Table 5 make clear, both the teachers in Groups I and II combined and those in Group III reported enormous increases (about 90 percent in both instances) in the number of objectives which they felt confident of their ability to help their pupils achieve. The absolute gain in this respect, however, was not as great for Group III (18) as it was for the teachers in Groups I and II combined (22). Again, we can only conjecture as to the possible reason or reasons. And again it seems most plausible to the writer that the chief explanation may relate to the resource units which the teachers in Group III had in their possession prior to the initial canvassing of their attitudes. Each of these resource

TABLE 6 Changes in Teachers' Attitudes Concerning the Importance of Helping Their Pupils Achieve the Objectives of Aviation Education

Group	Mean Number of Objectives		
	Seen as Being of Greater Importance	Seen as Being of Same Level of Importance	Seen as Being of Less Importance
Groups I and II	17	52	2
Group III	26	40	5

units calls attention to a great many things which the achieving of the objectives with which it deals either requires or makes it desirable for the teacher to do. This could well be not only sobering but conducive to a more realistic species of self-appraisal.

This brings us to our third comparison. Column 1 of Table 6 reports the mean number of objectives of aviation education which, during the period of their flight experience, the teachers in each of the two classifications came to view as being more important for them to help their pupils achieve. Columns 2 and 3 round out the story by setting forth the means for the objectives concerning which there was no shift of opinion and for those which "lost ground" in the respect just suggested. Contemporaneously with their flight experience, and to a numerical extent more than 50 percent greater than was true of the other teachers, the persons in Group III typically came to attach greater importance to helping their pupils achieve some 26 of these 71 objectives. They characteristically reported no change in the species of attitude here connoted in regard to some 40 objectives, and they typically came to view some five as being less worthy of their attention. The corresponding means for the teachers in Groups I and II combined were 17, 52, and 2. These differences cannot be explained away by saying that the teachers in Group III came to see a greater number of objectives as being sensibly related to their teaching, for this was not the case (see Table 4). Nor can they be explained away by saying that the findings mirrored in Table 6 are but a consequence of those reported in Table 5, for this is also untrue — if growth in self-confidence explains the changes noted in Table 6, the results would favor not Group III, as they do, but the other teachers instead. Clearly, then, their reactions to something that transpired during the period of their flight experience led the members of Group III, to an extent greater than that reported by the other teachers, to attach increased importance to helping their pupils achieve a greater number of the objectives of aviation education. As before, one must resort to conjecture in any attempt to explain this finding. The writer has none to offer in this instance.

TABLE 7 Comparisons Between the Extent of Changes in Attitude as Reported by Men and Women Teachers

Item	Men Teachers (22)	Women Teachers (10)	Difference
Mean Number of Objectives of Aviation Education Seen as Being Sensibly Related to Teaching Field			
Before Taking TFEC	39	47	X
After Taking TFEC	48	59	X
Difference	9	12	3 (W)
Mean Number of Objectives of Aviation Education Felt Confident to Handle			
Before Taking TFEC	19	29	X
After Taking TFEC	41	47	X
Difference	22	18	4 (M)
Mean Number of Objectives of Aviation Education Seen as Being of Greater Importance to Help Pupils Achieve	17	29	12 (W)

It has already been observed that teachers of both sexes were included in this study, and that Group III and Groups I and II combined were virtually identical in respect to the proportions of men and women teachers included in each. All told, there were 22 men and 10 women in the group. Except for the fields of art and industrial arts, every speciality represented in the study was engaged in by one or more of these ten women. Table 7 has been included to show the sex differences which were revealed by that part of the study in which the attitudes of the participating teachers were systematically queried. It will be observed that greater changes in attitude were reported by the women than by the men teachers in respect to two of the three viewpoints queried in the pre- and in the post-flight-experience inventories. Teachers of both sexes, however, made very substantial changes in their outlooks in all three respects.

The data of Tables 1 through 7 above tell us *how many* of the 71 objectives of aviation education, but not *which ones*, figured in the changes in the teachers' attitudes which occurred while they were taking the Teachers' Flight Experience Course. To tell the other part of the story would require the lengthening of this bulletin by over fifty pages, for eight additional tables, each about five pages in length, plus an accompanying text for each table, would have to be added in order to do so. Perhaps the best that can be done here is to name those among the 71 objectives which, at the conclusion of the Teachers' Flight Experience

Course, about a third or more of the teachers said it was of very great importance to help their pupils achieve. Here, then, are these objectives:

- To help pupils acquire a sufficient elementary knowledge of the simple scientific principles of flight to enable them to be modestly literate in this regard.
- To help pupils understand the uses of aviation in the conservation of soil, timber, and wildlife resources.
- To help pupils note at least the high points in the history of the development of transportation since *circa* 1800 to the end that they may appreciate how drastically, and in recent years how speedily, both their nation and the world have shrunk in point of travel time.
- To help pupils appreciate the causal relationship between the air power of a nation and the literacy of its population; understand why only a highly literate people can produce, maintain, and operate modern military airplanes; recognize what this implies for their own education.
- To help pupils appreciate the causal relationship between the air power of a nation and the knowledge of tools, mechanical processes, and the nature of materials possessed by its population; understand why only a people highly informed and well skilled in this regard can produce, maintain, and operate today's military airplanes; recognize what this implies for their own education.
- To help pupils appreciate the causal relationship between scientific theory and the air power of a nation; understand why competitive advantage in this regard will always rest with the country that best trains and utilizes its brains; recognize what is here implied for their own education.
- To help pupils understand how and when, compounded with the atom (now the hydrogen) bomb, the airplane has brought into being a world situation in which, in the words of Justice William O. Douglas of the United States Supreme Court, "some sort of world government has become indispensable to survival"; understand why world peace is possible only under world law, why world law is enforceable only under conditions of universal justice, why world justice is possible only on the basis of sympathetic understanding, and hence why there must be educated into the minds and hearts of men everywhere on this earth a sympathetic understanding of (a feeling with and for) all the "other fellows" if there is to be world peace.

IV

It will be recalled (see p. 4) that each of the teachers included in this study agreed to respond to a free-response letter of inquiry at the end of

the school year immediately following his period of flight experience. As also noted above, this letter asked the respondent to tell what, if anything, he had done differently in his capacity as a teacher which seemed to him attributable to the aviation-related experiences provided under the auspices of this study. All but a very few of the 32 subjects responded to this letter; with but two exceptions (a teacher of industrial arts and a teacher of social studies), the few who supplied no response could not do so, as they were no longer "in the capacity of a teacher" — had become a school principal, or married, or left secondary school teaching for some other reason. One person, a teacher of art, had not yet completed his succeeding year of classroom teaching when the publication was written, so had not yet been invited to respond.

Here are typical statements from the replies which were received. The Roman numeral in parentheses indicates whether the respondent was in Group I, II, or III as these were described above.

1. **From a teacher of English:** "In both my sophomore and senior classes I assign research units to be done. The student chooses any topic of vital interest to him. Many, especially boys, choose problems that deal with the air age. Since my flight course, I am much more informed and more confident of myself when offering contributions.

   "I have used the resource unit as a teaching guide. I have also given it to my advanced students to read and study as a guide in their research.

   "Then, too, I have drawn upon my flight experience in casual ways. In informal conversations in a teacher group, I have been able to contribute some of my experiences. I've thrown in bits of information now and then to discussions, feeling very confident as I do it. Much prestige goes along with one who has taken the flight experience course.

   "Perhaps the greatest thing I was made aware of was the vital part that airplanes have in our nation's defense. I am now more interested in anything that pertains to flight." (II)

2. **A second teacher of English:** "I find that it is difficult to express my personal feeling toward the Flight Experience Course for Teachers without sounding too enthusiastic. As a result of the flight experiences and association with the instructional and directing staff, I have found an enrichment and pleasure that has entered my personal life. I have discovered that I had many hidden fears that found their surface expression when I attempted to 'leave the ground.' Recognizing these fears I have been able to meet them squarely and I have found satisfactory solutions for them. As I move away from the immediacy of the actual experiences of flying, I find that I have a new perspective and outlook for my life. I have a deep interest in all things associated with flying.

   "I believe that the strangeness of the learning situation which placed the teacher in the pupil's level of learning was a valuable experience. I knew nothing about the most elementary facts associated with flying. . . . I had to learn how to read the points of the compass. From personal experience, I can appreciate the difficulties that my pupils face in their English classes when they are attempting to learn to use new facts of language usage. I

know that I have more understanding and sympathy for their learning process. This factor of my teaching has made the entire experience one of immeasurable value to me, to the school and community.

"Small personal touches enter into my teaching. For example, I have pupils keep a 'theme log' in place of a 'theme diary' which they formerly kept. Boys always protested keeping a 'diary' because they objected to the idea that 'diary-keeping' was a girl's activity and they objected to the discipline that is required to meet routine tasks.

"I hope that I have become more broad-minded as a result of the experiences of the Flight Experience Course for Teachers." (III)

3. **A third teacher of English:** "When I began the course, I was, quite frankly, more than a little green, and quite scared. I knew, vaguely, that the plane flew, but I did not know how or why. I had some idea that there were many problems connected with aviation, but it was beyond me just what these problems actually were, and I had no idea of how they might be solved. I knew that there was some system of control over flights, but just how the airways control system worked was a total blank.

"More significantly, I could not talk intelligently with my students who were interested in the field of aviation. I had no idea of how to incorporate in my classes the important phases of air-age travel, especially in the field of social studies. Yes — I was really green.

"I do not claim to have gained all the answers, but I can now show more definitely how the increase in world travel is requiring a greater ability for the change of ideas, both cultural and political. It is possible for me now to show how the events that take place half a world away are in reality only a few hours away by air. I can now show how this increased air travel makes necessary an increase in ability to communicate with other nations.

"The TFEC course has made it possible for me to explore new ways to teach the effective use of the English language. I can show that communications skills are now more than ever important, not only for us to be able to communicate among ourselves intelligently and intelligibly, but on a world-wide basis as well.

"I can also use the general interest in air-age travel as a basis for themes and written work. I can help the students find television and radio programs of an interesting and informative nature, and to help them evaluate these programs in the light of their interests and possibly their careers.

"Many of my students are keenly interested in aviation from a scientific angle. Still others are looking forward to a career in civilian aviation. I can now better show them what is expected of them — the psychological and physiological requirements, the academic backgrounds in mathematics and science, and the real desire to live and work in aviation.

"Last, and undoubtedly just as important, I feel that this flight experience has given me many hours of sheer enjoyment and pleasure in having accomplished something new. I can now look up to the sky when a light plane goes buzzing along, and say, 'Gosh, how I'd like to be up there!' That, within itself, is really a change of attitude. I believe my new love and regard for flying as a personal thing is something that cannot be measured or truly shared." (III)

4. **From a teacher of industrial arts:** "I have done nothing formally such as setting up new units in my course. However, I have been able to answer . . . questions which arose in and out of class. I have several students who are intensely interested in model planes and in flying. They have asked many questions about how planes fly, details as to control movements in landing and taking off, airports, and other things too numerous to mention. My prestige with this group has definitely risen. Perhaps some of them figure that if that old codger could solo, anyone could." (I)

5. **From a teacher of mathematics:** "I made use of aviation materials, such as weather maps, aeronautical charts, graphs, and pictures of airplanes, on my bulletin board. I increased my students' vocabulary by introducing them to such words as lift, gravity, thrust, drag, and pitch. I am working up a downtown window display on 'Mathematics and Aviation' for American Education Week this coming year. I have shared my resource unit with other teachers. I have enjoyed the interest shown by students when they learned that I had flown an airplane." (II)

6. **A second teacher of mathematics:** "The flight experience course has made me more conscious of articles on aviation. This increased interest and awareness has given me more confidence in matters concerning flying. This added confidence has made me better able to present topics dealing with aviation in my classes.

   "I now tend to use problems connected with flying that I would never have thought of before.

   "Probably the greatest change in my teaching was due to the increased prestige that I enjoyed. Most of today's high school students are very interested in flying so anyone who has flown is automatically elevated several degrees. My students, knowing that I had flown, considered me an expert and worked harder on problems about aviation.

   "In four different classes (general math, algebra, geometry, advanced algebra) I was able to present some topics from aviation in a more forceful and interesting manner than I could have done without the flight experience course. The course gave me added knowledge, and with it increased confidence concerning aviation." (II)

7. **A third teacher of mathematics:** "I enjoyed the course very much but felt that the fact of merely learning some experiences of flying hardly was enough to fit the teacher to find or use many applications for his classes. I was able to make a few applications in my math classes. Perhaps the inspiration of flying carried over to some of my students." (III)

8. **From a teacher of science:** "I feel the Flight Experience Course has benefited me as a teacher of physics in the following ways:

   "1. Although I had previously taught the principles of flight and the mechanics of the plane, it all become more concrete both to me and to the students after I had had the course.

   "2. Anything I taught about flight or the plane had more weight with the students when they knew I had had some personal experience.

   "3. Many of them became interested in flying and in learning to become pilots after hearing about my experiences.

   "4. I learned much about the control of traffic in the air and about navigation which I was able to pass on.

"5. The modern methods of training pilots with the use of simulators was impressive both to me and the students." (III)

9. **A second teacher of science:** "This instruction has been very valuable to me as a physics teacher. I have shown filmstrips and movies on the controls of the airplane; we have discussed lift, drag, roll, pitch, and yaw, but I know I can add a little more spark to these discussions, now that I have experienced these motions with the airplane. I knew what the book said about flight but it is so much more fun to talk about something that you actually know how and what you are doing.

"The flight to Chicago was wonderful, the Bonanza was a little different than the Aeronca, but it was fun to be at the controls of the larger ship, even though we were not able to take it off or land it.

"The visit to the control tower was very enlightening. I didn't know there was so much going on behind the scenes in controlling flights of all the aircraft. It was interesting to know how the flight schedule of an airliner is made up before take-off and then how the pilot keeps in constant communication with the airport as to his location, so they will know the exact minute that he will arrive and can give him instructions on just how and when to approach the airport for landing.

"The most fascinating feature was the radar control of the passenger ships. We watched two airliners leave Chicago, on the radar screen; the engineer at the radar control practically drove both ships out of the city. He plotted the paths of each ship and obtained the altitude from the pilots by radio; then he told them how high to fly and where to go. During the next physics class we didn't talk about much except my trip to Chicago.

"I wish I could have finished the course sooner, all of my students wanted to know when I was going to solo. I can tell them next year and I know we will spend a little more time on airplanes and flying in general next year, as I will have something to talk about and will know what I am talking about!" (III)

10. **A third teacher of science:** "The course took flying out of the realm of adventure and turned it into a practical reality for me. Like many people, I had looked at flying as being something others did, but not something I should be concerned about. Actually handling the plane myself gave me a chance to get over a fear of flying I had acquired as a passenger in small craft.

"The pupils of today are going to be facing a good many problems of air traffic for which I am now better able to prepare them. Having a teacher who has a first-hand acquaintance with flying also helps the pupils accept the idea of a *serious* career in aviation. Aviation as a *business* needs to be stressed in our schools.

"As a follow up, I plan on taking Aviation 101 next summer." (III)

11. **A fourth teacher of science:** "I know I was much more effective as a teacher of aviation [education] this year. . . . In comparing my classes this year with those of previous years, I was extremely interested to see the difference in attitude toward myself as well as toward the unit. My enthusiasm was no longer smiled at indulgently, but was accepted as behavior proper to one who had become an 'authority' by virtue of actual doing [flying an airplane]. . . . As a direct result of the flight experience course,

we devoted much more time this year to the actual mechanics of flight than we had in previous years. This was due partly to the fact that I felt more secure in my own understanding. . . . One of my boys built a working model . . . large enough to sit on, and for two extra weeks my six classes 'flew' constantly. . . . We spent several additional days discussing . . . future possibilities of the field of aviation." (I)

12. **A fifth teacher of science:** "The course . . . has had an effect on my science teaching. In the seventh and eighth grades I had about a three weeks' unit on aviation. This unit was rich in social studies and language arts materials as well as science. I could not find suitable reference material on how to fly small planes so I wrote (and duplicated by ditto) a booklet myself. At the close of the unit the children divided themselves into four groups and did research reports on their chosen subjects: (1) History of Aviation, (2) Famous Men of Aviation, (3) Instruments Used in Aviation, and (4) Commercial Aviation.

    "As a climax we took a trip to Chicago's Midway Airport (about 50 miles away) where we had a conducted tour. . . . This unit was very well received by the students. Their enthusiasm was unlimited. I am sure that my own enthusiasm was of much help." (I)

13. **A sixth teacher of science:** "In my junior high school (eighth grade) science class a unit on aviation was taught. More emphasis was placed and more time spent on this unit than probably would have been the case had I not taken the Flight Experience Course. In addition to the theory of flight which was well covered in the text, considerable time was spent on aircraft and flight safety and regulation of aircraft. Under these [topics] such things as the pre-flight check, inspections, licensing, basic air regulations with emphasis on safety, the effect of weather on flight safety, and safety precautions from take-off to landing were presented. This information was used to supplement the text. In addition, I was able to describe the feeling of some of the various phases of flight such as take-off, banks, stalls, landings, and night flight, and to present some of the advantages and limitations of flight as a means of travel compared with surface travel.

    ". . . a trip to the Kankakee Airport about fifteen miles away was arranged. While there we inspected the various types of single and bi-motored aircraft available, saw a Link Trainer and had its purpose and operation explained, looked at the engine repair shop and paint shop, listened to . . . signals on the radio. All of the students were able to get inside of an airplane and a fifteen-minute flight was arranged for all who desired and could afford to take it. About a third of the class took advantage of the opportunity. Apprehension was replaced by pleasure.

    "The enthusiasm for the unit on the part of the teacher was a direct result of the Flight Experience Course, and I feel safe in saying that this enthusiasm was picked up by a goodly, though indeterminate, number of the class. Interest in this unit was highest of any unit thus far this year even though it was not the most popular by class vote when the units of study were selected by the students at the first of the school year. . . .

    "In freshman citizenship classes the Flight Experience Course had an incidental rather than a planned use. It provided some illustrations of governmental services and regulations. Some basic flight rules and an explanation

of the operation of the CAA field office at Chicago Midway Airport are the ones which I recall." (I)

14. **A seventh teacher of science:** "I have discussed the theory of flight in both sections of my general science [course], i.e., the relationship between Bernoulli's work and the airfoil and the propeller; the 4 basic forces which act on the plane in flight, the ways in which the different controls make the plane respond; torque (especially its effect on take-off) and other such information . . . I have also stressed the various uses of the airplane and also the need for an advancement in the interest in the airplane." (I)

15. **An eighth teacher of science:** "For the first time in my teaching career, I taught a unit entitled 'What Biological Adjustments Are Related to the Hazards and Complexities of Modern Living?' The following topics were discussed after reading all material available in the public and school libraries:

    I. The Role of the Airplane in Possible Biological Warfare
        A. Public health and safety in case of an atomic attack
    II. Biology, Aviation, and Global Living
        A. Safety in flight
            1. Biological requirements for flight
            2. Physical requirements of fliers
            3. Personal experience while taking Flight Experience Course as a Link Scholar
        B. Benefits to global living made possible by the use of the airplane
        C. Biological problems in the Air Age
            1. Problems in human relations
            2. Problems in forestry
            3. Problems in insect control
            4. Problems in the widening environment
    III. Practical Applications
        A. Field trips to two air fields in Peoria" (I)

16. **A ninth teacher of science:** "In general science we spent about a week talking about the different parts of the airplane and how the airplane flies. . . . We took off from there and talked for several days about safety regulations of the CAA and how landings are made at Midway Airport in Chicago. . . . Some of the children brought in materials from the Air Force and we had an interesting discussion on the future of airplanes and helicopters.

    "After going through the resource unit, I used the section on safety in aviation and also used [some of] the films that were listed.

    "I feel that in future years this experience as a Link Trainee will grow. I hope that someday I will be able to continue my training and get my private pilot's license. I have been sold on the value of private air travel. Either in teaching or the Christian ministry [he has now entered a theological seminary] I am sure that I will influence people toward my way of thinking on aviation." (II)

17. **From a teacher of social studies:** "The Flight Experience Course modified and changed my thinking and class procedure much more than I would have believed possible. It informed me to the extent that I can talk more

intelligently with my students who already are very literate on most phases of the air age, and it has developed an interest and awareness in me which has resulted in building up a stock of good current reference materials and in being ready to discuss new developments in all fields of aviation.

"In addition to spot discussions in connection with newspaper and magazine releases, the [my] classes did a number of things to highlight [their] aviation education. A group of junior boys planned and made a fine bulletin board display highlighting the pioneering of SAS in its commercial polar flights and painted a mural, 'Speed Makes Neighbors of Us All,' showing in bold colors what new modes of travel have done to distance.

"The tremendous impact of the airplane in drawing nations closer together and in influencing the lives of many people in remote areas was made a part of [my] class work. . . . The Congo . . . and South Africa were only two of many areas where such changes were noted. The urgent need for an understanding of other peoples and their understanding of us was the subject of a panel discussion by a group of [my] senior students. It was called 'As Others See Us,' and was presented at the state meeting of [the] social studies teachers [of Illinois] in Decatur." (I)

18. **A second teacher of social studies:** "I have noted definite changes in both my classroom and extracurricular work as a result of having taken this course. . . . [I have] used this information time and time again in my classes, my homeroom, and in various other activities. . . . I have been able to answer the questions that students have asked about airplanes and air travel that I certainly would not have been able to answer prior to taking this course. I have been able to take the initiative in my world history classes in discussing many phases of aviation that I would not formerly have been able to do. Many teachers knowing that I took this course last summer have come to me with questions concerning aviation, and especially concerning air travel." (I)

19. **A third teacher of social studies:** "Let me give you a few details on how I initiated and expanded the course to include other modes of transportation in America, and how the importance of aviation commanded a predominate place in the minds of the students.

"Mimeographed assignments . . . were distributed among the students. I divided my projects into two groups; namely, mechanical and written. The mechanical projects included the construction of airplane models, aircraft carriers, PT boats, schooners, cars, etc. . . . Plane models were hung from wire which was extended across the room. My room, indeed, looked like a workshop — some called it a museum — but whatever the name it carried, it accomplished its purpose; to instill in youth the desire and hunger for knowledge. History became a living thing and part of their daily lives.

"I took the juniors and seniors to the Koerner Airport in Kankakee. The tour was quite exciting, for after observing the facilities of the airport they took a cruise over . . . the city of Kankakee in a Piper Tri-Pacer. . . . the tour, I'm sure, will truly be remembered." (II)

20. **A fourth teacher of social studies:** "We began our work this year by studying some of the tools, equipment, source material, etc., with which we would be working during the year. . . . I don't believe I have ever before emphasized quite so much the differences in various map projections. We showed the film 'The Airplane Changes Our World,' which illustrates

quite well the distortions encountered in various map projections. Throughout the year we have continually referred back to this information and considered the differences in maps. It was quite common for us to compare two or more maps and discuss the reasons for their differing from one another.

"We also talked a great deal about isolationism and its apparent loss of popularity. The airplane, of course, played an important part in such discussions.

"Several times during the year the question of safety in transportation came up. Many of the students in my classes have fathers who . . . use air transportation a good deal of the time. One little girl expressed concern over her father's safety in traveling by air. This was an excellent opportunity for having the students do some research on comparative safety statistics.

"During a unit on world trade we used some poster-type pictures from one of the airlines which showed the variety of products carried by airplanes in world trade and the many remote areas of the world served by air transportation.

"In reading and talking about the antarctic area we considered carefully the use of aircraft in exploring — even during the earlier expeditions. I have requested for next year that the school purchase several polar maps for use in social studies classes.

"During our study of the State of Illinois one of my students gathered quite a little information about air transportation in our State. He used the resource unit for finding places where he could write for information.

"I . . . told my students of my flying lessons early in the year. They were very impressed and never finished asking questions — especially the boys who already knew quite a little about airplanes and flying. As for my fellow teachers, I think most of them regarded me as a person who had done something they had always wanted to do but probably would never get to do." (II)

21. **A fifth teacher of social studies:** "As a result of my flight experience I made a greater effort to encourage our teachers to use the material published in Parts A, B, and C of Bulletin 22, 'Our World of Flight Series.' Our math department reports that they used many of the problems included in *Mathematic Teaching Aids for a Stronger America.* Our science department reports the use of some of Sections 5, 6, and 9 of *Science Teaching Aids for a Stronger America.* Pages 49-53 of *Guidance Aids for a Stronger America* were also a big help to our guidance counselor. *Social Studies Teaching Aids for a Stronger America* was utilized in our ninth-grade social studies classes and as a guide for obtaining material to fill in our vocational opportunities file. Next year our social studies department has plans for using much of Section 3 of this resource unit. This will be adapted for use in world history as well as American history.

"In my American history class I found that I was able to present a much more convincing picture of the effects of aviation on the social, economic, and political development of the world. I found that as a result of the local publicity I received because of my participation in the flight experience course (and because it is common knowledge within the community that I am continuing with flight instruction) that any comments and suggestions

I have made within the classroom concerning the effects of aviation's progress seem to have carried more weight with the students.

"I have been made even more conscious than I previously was of the need to interpret distance in terms of time rather than miles. As a result, we spent some time in class discussing the effects of this on the development of our nation and its influence on the present position of the United States in the world's family of nations.

"Also, we spent some time in a study of the vocational possibilities that have been opened up as a result of the development of the aviation industry.

"We utilized a great deal of material sent us by United Air Lines including the films 'Scotty Wins Her Wings' and 'Of Man and Wings.' The latter was shown at an assembly of the entire student body." (II)

22. **A sixth teacher of social studies:** "As a social studies teacher I have had several opportunities to refer to flying and because of my flight experience I have been able to give my students some firsthand information which I'm sure I could not have given them without having had the flight experience course.

"I feel the course was well worthwhile and it will continue to be a valuable experience to me for giving firsthand information to my social studies students and possibly interest some of them to the extent that they not only will be more interested in using air transportation as a means of travel, but possibly even persuading some of them to take pilot training as well." (III)

23. **A seventh teacher of social studies:** "I have found the Flight Experience Course very helpful when talking with students about flying. Questions are being asked and more can be expected in the future. When I talk with students about flying, it is a definite advantage to have had some firsthand experience.

"A better understanding of the theory of flight, the stress upon safety, as well as the thrill of actually flying the plane makes for a much more definite and lasting impression as a result of the practical experience gained from the Flight Experience Course. I feel that I can discuss flying with more confidence and authority than before, which should be the students' gain, too.

"Also, I think one feels a certain amount of personal achievement." (III)

24. **From a core course teacher:** "I find myself much more aware of and alert to implications of aviation in any area that arises. I look at the weather in terms of flight possibilities. I read and discuss the articles in papers and magazines about air problems. I bring flight experiences into conversations.

"I have become a gospel-spreader. I talk about values of flight for ordinary people, as well as its greater implications in tightening our world interdependence, in school and out.

"Several faculty members have sought me out to discuss how it feels to fly, how difficult it is to learn, how they could try it for themselves. I have influenced at least one other faculty member to take flying lessons, and she is fully as enthusiastic about it as I; she is now looking around for a plane to buy.

"I have read and have asked our school librarian to buy several books for

our 629.13 shelves — books that tell about flying itself, not the usual 'pictures of planes' types found there previously." (II)

25. **From a guidance counselor:** "Since I had previously had experience, during the war, in aircraft production and maintenance but never flight, this was a unique experience for me. In guidance work, I find that I am more keenly aware of job opportunities and in my general science class I find myself subtly using examples from the air-age, flight, etc., to illustrate points.

"From a curriculum point of view, I believe many of our teachers can be encouraged to incorporate units in several subject areas with the air-age as the focal point. I further believe some of us, through flight experience, now have the impetus to see that more of this is done." (III)

26. **Finally, a second guidance counselor:** "The information about planes and their parts, the theory of flight, and the rules and regulations of flying gained from our instructor, the manual, the trip to Chicago, and especially my actual experience in operating the controls have given me definite benefits. These include increased responsiveness to student enthusiasm, personal awareness, and understanding and appreciation of literature in this field. I can now, for example, better understand the explanations of just what the pilot was doing with the controls when he maneuvered the plane into position for the bombardier and more fully appreciate the feelings of the paratrooper trainee who could not jump.

"My feeling, in general, is that the course has made me a better teacher and counselor of air-age youth by adding to the sum-total of my experience in living. It seems to me that any experience that makes one more understanding and appreciative of his environment is especially worthwhile for the teacher and the counselor.

"Since, for the past year I have not been teaching any classes, and since, as a counselor, I talk to girls chiefly, rather than to boys, I realize that the course has not been of as direct benefit to students as I feel it will be next year, when I shall again be teaching three English classes. With several of my counselees who are interested in becoming air stewardesses, however, the course has served to establish better rapport.

"As was prophesied last fall, the five of us who participated in the project have gained a bit more respect from the student body. Our taking the course has certainly contributed greatly to bridging the gap between youth and maturity. I know that we are not quite so old in the eyes of the senior high school teenagers as we were before our flying experiences." (III)

These excerpts from the teachers' letters and the opinion data reported in Tables 1 through 6 above seem to suggest quite clearly that the aviation-related experiences provided in connection with this exploratory study tended to have the following consequences:

1. They served either to awaken the teachers to, or to sharpen their awareness of, the need for aviation education in the secondary school.

2. They helped the teachers to see many more, and perhaps closer, relationships between the objectives of aviation education and the proper purposes of their respective teaching fields.

3. They helped the teachers to gain confidence to do more about aviation education in their schools.

4. They gave the teachers more prestige in the eyes of their pupils and their colleagues.

5. They disposed the teachers to air travel and, in some instances, to further flight training.

This study was too lacking in adequate controls, and the number of subjects involved was too small, to warrant confidence in any conclusions that might be drawn respecting the relative effectiveness for aviation education purposes of (a) having the special preparation of the teachers consist of taking the Teachers' Flight Experience Course (Group I above), (b) having this special preparation consist of taking this course and of making one's self familiar with the cited resource unit in his teaching field (Group II), or (c) having this special preparation consist of the two undertakings just noted but augmented by the knowledge that the head of one's school is undergoing the most novel part of the preparation (flight experience) with one (Group III). We have already observed (Tables 4, 5, and 6) that what differences there were in respect to the reported changes in attitudes tended to favor Group III. No such tentative conclusion seems to be warranted by the letters quoted above, however. Said differently, in terms of what happened in their classrooms during the year following their flight experience, no appreciable advantage seems to be observable for the teachers in any one of the three groups. One or more persons in each group reported evidences of considerable if not great growth in respect to aiding pupils with aviation education activities, and one or more teachers in each group reported little such evidence of "good works." Until more conclusive evidence is adduced, then, it would seem wise to be guided by considerations of face validity. The second of the three alternatives noted (the Group II approach) has more face validity than the first (Group I approach), and the third (the Group III approach) the most face validity of all.

It seems from the evidence of this exploratory study, however, that much credence can be accorded one conclusion. This is that, in the case of nearly all the subjects involved, taking the Teachers' Flight Experience Course resulted in educationally significant differences in what these teachers said that they either thought or did respecting aviation education.

APPENDIX A. Inventory of Attitudes Toward Objectives of Aviation Education

Harold C. Hand, Professor of Education at the University of Illinois, prepared a checklist of 71 objectives of aviation education. Each participant evaluated the objectives in the light of three questions: Does this objective sensibly relate to your teaching field? (Check yes, uncertain, or no.) If it does so relate, how important do you feel that it is for *you* to help the pupils in your classes to achieve this objective? (Check very great, great, some, or little or no.) If this objective is sensibly related to your work, how confident are you of your ability to help pupils achieve it? (Check very confident, confident, dubious, or very dubious.)

Objective: Pupils should be helped to —

1. Acquire an elementary knowledge of the military uses of aviation both for offense and defense, and thus see why air power is extremely necessary for national security.

2. Understand the potential benefits of aviation in disaster control associated with the bombing of American cities.

3. Appreciate the relationship between the air power of a nation and its possession of or ready access to strategically located air bases; understand in general where over the earth's surface these strategic locations are situated.

4. Appreciate the causal relationship between the air power of a nation and the literacy of its population; understand why only a highly literate people can produce, maintain, and operate modern military airplanes; recognize what this implies for their own education.

5. Appreciate the causal relationship between the air power of a nation and the knowledge of tools, mechanical processes, and the nature of materials possessed by its population; understand why only a people highly informed and well skilled in this regard can produce, maintain, and operate today's military airplanes; recognize what this implies for their own education.

6. Appreciate the causal relationship between the air power of a nation and the work habits of its population; understand why only a people with good work habits can in the minimum time produce the military planes that their country needs; recognize what this implies for their own education.

7. Appreciate the causal relationship between the air power of a nation and the physical strength and vigor of its population; understand why it takes a people with high vitality and no absenteeism due to preventable sickness or accidents to produce in time the military planes that are needed by their country; recognize what this implies for their own education.

8. Appreciate the causal relationship between scientific theory and the air power of the nation; understand why competitive advantage in this regard will always rest with the country that best trains and utilizes its brains; recognize what is here implied for their own education.

9. Explore the requirements and offerings of the air branch of the military establishment as a basis for planning their preparation for later service.

10. Secure an elementary knowledge of the fortunes of the aviation industry; and understand what it is probably necessary to do, and why, to maintain this industry in the state of good health which the well-being of the nation requires.

11. Acquaint themselves with the services and facilities which the airports

in their community afford; and understand how these benefit the people of the area.

12. Understand how and to what extent air transportation is employed, and how it benefits agriculture, business, industry, and government.

13. Understand how air transportation is bringing about changes in the techniques of agriculture, business, industry, and government, and how this is beneficial to the community.

14. Understand how and to what extent air transportation is employed in carrying the mail, and how this benefits the nation.

15. Understand the uses of aviation in law enforcement.

16. Understand the uses of aviation in the conservation of soil, timber, and wildlife resources.

17. Understand the uses of aviation for the relief of distress in remote, isolated, or devastated areas.

18. Understand the recreational uses of aviation.

19. Appreciate how handsomely our universal American "automotive know-how" paid off in both world wars; and understand how necessary to national security it now is for "aviation know-how" to be widely distributed in the population.

20. Understand what ground facilities — airports and their facilities, air strips, radio ranges, beacons, instrument landing systems, etc. — must further be provided, and why, to insure safe and efficient air transportation.

21. Acquire a sufficient elementary knowledge of meteorology to understand what must further be done by way of weather observation, forecasting, and reporting to facilitate the development of aviation.

22. Understand how and why the further development of radar, of radio communication, and of other electronic devices is requisite to the strengthening of both civilian and military aviation and hence to the well-being and security of the nation.

23. Understand what regulations governing the movement of aircraft, their inspection, maintenance, and certification, and the training, examination, and certification of pilots and mechanics, etc., are essential for safe and efficient air transportation, and why.

24. Acquire a sufficient elementary knowledge of how aircraft are manufactured to understand what principally is involved when, as at present, a vast expansion of the aviation industry is called for.

25. Understand how and why the development of the railroad benefited the American people, and how and why the improvement of highways and the use of the automobile further added to the strength of the nation.

26. Note how heavily the federal government subsidized the development of the railroad through land grants, and how abundantly it paid the people for it to do so.

27. Note how the utilization of the automobile and the development of the automobile industry waited upon, and was made possible by, the federal subsidization of highway construction, and how handsomely this benefited the people.

28. Note how heavily the federal government is currently subsidizing the automobile industry through the financing of highways, and how this benefits everybody.

29. Understand how and why, like the railroad and the automobile industry, the aviation industry requires federal subsidization, and how the doing of this by the government further promises to benefit the nation.

30. Acquire a sufficiently good command of the vocabulary commonly utilized in newspaper, radio, and other discussions of airplanes, aviation, and related matters to understand what is being said.

31. Acquaint themselves, by first-hand experience whenever possible, with the procedure one follows in planning and taking a trip in a commercial airliner.

32. Acquaint themselves, by direct experience if possible, with the travel accommodations afforded by commercial airlines.

33. Familiarize themselves with the etiquette ordinarily encountered in a commercial airliner.

34. Learn how to buy aviation services and products wisely.

35. Secure an elementary knowledge of how airplane traffic is controlled in the vicinity of and on a modern municipal air terminal and on the airways.

36. Secure at least an elementary grasp of the implications of air traffic and airport zoning on property uses, property values, and community planning.

37. Acquire a sufficient elementary knowledge of the simple scientific principles of flight to enable them to be modestly literate in this regard.

38. Secure a sufficient elementary knowledge of airplane structure to be reasonably informed in this respect.

39. Acquire an elementary general knowledge of turbo-jet propulsion which is so rapidly becoming a part of our everyday lives.

40. Acquaint themselves with present achievements and probable future developments in supersonic flight, and sense the likely consequences in civil and military aviation.

41. Experience flight, the basic reality of the air age.

42. Debunk the superman misconception of the physical, mental, and age requirements for personal flying (private pilot).

43. Acquaint themselves with the benefits of private flying in reference to farm and business profits, effective utilization of time and manpower, resources for disaster control, and recreation.

44. Acquire an elementary knowledge of the character of the principal requirements for safety in aircraft operation.

45. Understand the good and bad effects of aviation on the preservation and enjoyment of fishing, hunting, and camping areas, and appreciate the need for effective regulation and control.

46. Acquaint themselves with the comparative safety statistics of rail, automotive, and air transportation; and note how closely comparable are the rail and commercial air statistics.

47. Understand the principal causes of aviation accidents, and appreciate the need for effective precautionary regulations and controls.

48. Understand and appreciate the personal safety and safety-to-others purposes of aviation regulations.

49. Become sufficiently well acquainted with the principal responsibilities of the Civil Aeronautics Board, the Civil Aeronautics Administration, and the civil aeronautics agency of his own state to understand why the work of these agencies is necessary for the development of safe and efficient air transportation.

50. Understand how and why weather is the principal uncontrollable deterrent to flight; know what is being done to reduce or eliminate this impediment; understand how this benefits the American people.

51. Acquire the ability to read and understand prognostic weather maps.

52. Become sufficiently acquainted with the elementary principles and basic requirements of aerial navigation to understand how the factors thus involved influence the development of aviation.

53. Acquaint themselves with the nature of the various occupations in the aviation industry, and be sensitized to their social significance.

54. Appraise their interests and aptitudes as these apply to whatever, if any, of the various aviation occupations they may be contemplating as vocations.

55. Inform themselves concerning the vocational possibilities in the aviation industry; the types of occupations variously included in this industry; and the factors of supply and demand, qualifications and training required, salaries, conditions of work, prospects for advancement, etc., in reference to each.

56. Note at least the high points in the history of the development of transportation since *circa* 1800 to the end that they may appreciate how drastically, and in recent years how speedily, both their nation and the world have shrunk in point of travel time.

57. Note and understand why every major city on earth is now less than 40 hours distant from any other principal city in any country.

58. Understand why this progressive shrinking of travel time can be expected to continue into the foreseeable future.

59. Note and understand how markedly the development of aviation has changed the direction one travels to get to other countries by the shortest available route.

60. Note and understand how the conventional map (mercator) thus gives a false impression as to where and how far away the cities and countries in other continents and on the principal island land masses actually are.

61. Appreciate the fact that basic resources from many other national states must be secured in order to manufacture a modern airplane, to trace out what these importations are and the countries from which they come, and to note that by its very being the airplane thus symbolizes international cooperation.

62. Understand how and why the development of air transportation has, far more than either the railroad or the automobile, made neighbors of all Americans by the drastic reduction of travel time.

63. Note how and why the linking of two or more unfriendly tribes, cities, regions, or countries by highways, railroads, or water routes has historically contributed to reciprocal good will and mutual well-being; and understand how and why the airplane affords great potentialities in this regard.

64. Understand how the airplane has in effect removed the geographical barriers which formerly separated peoples of various countries from one another and how it has knit them together into an interdependent, one-world community.

65. Understand why, in such an interdependent, one-world community, language versatility is a requisite in modern political and commercial relationships.

66. Acquaint themselves with the geographical location of the major air routes and airplane terminals throughout the world; and trace the mutual benefits thereby derived by the many and diverse peoples thus linked together by air transportation.

67. Understand how good ideas and improved or more enjoyable ways of doing things are exported and imported through air transportation, and how these borrowings enrich the lives of their recipients.

68. Understand how the airplane has altered the significance for human life and happiness of such geographical facts as oil deposits, fissionable materials, and weather and terrain favorable for international air travel.

69. Understand how and why new problems of disease and pest control were created by the use of the airplane; and recognize that these problems can be resolved only by international collaboration.

70. Acquire an elementary knowledge and appreciation of the "freedom of the air" problems which must be resolved if the safest and most efficient system of international air transportation is to be obtained.

71. Understand how, when compounded with the atom bomb, the airplane has brought into being a world situation in which, in the words of Justice William O. Douglas of the United States Supreme Court, "some form of world government has become indispensable to survival"; understand why world peace is possible only under world law, why world law is enforceable only under conditions of universal justice, why world justice is possible only on the basis of sympathetic understanding, and hence why there must be educated into the minds and hearts of men everywhere on this earth a sympathetic understanding of (a feeling with and for) all the "other fellows" if there is to be world peace.

THE INSTITUTE OF AVIATION, established in 1945 as the Institute of Aeronautics, is operated as the administrative agency responsible for the fostering and correlation of the educational and research activities related to aviation in all parts of the University. Other functions include academic instruction, flight training, management of the University of Illinois Airport, and aeronautical research.

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BULLETIN FOUR:	Airport Zoning, J. Nelson Young, 1948. (Out of print)
BULLETIN FIVE:	Evaluation of the School Link as an Aid in Primary Flight Instruction, A. C. Williams, Jr. and Ralph E. Flexman, 1949.
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